E/CONF.39/H/37
SUMMARY

26 Nov.1962

ENGLISH
ORIGINAL : FRENCH

UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: H.1

France

STATISTICAL ANALYSIS OF ECONOMIC AGGREGATES

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No.1122 STATISTICAL ANALYSIS OF ECONOMIC AGGREGATES

H.1.(P.3)

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SUMMARY

Introduction

This study mainly concerns economic accountants and statisticians. Its particular aim is to define a simplified method of estimating economic aggregates in order to save a large amount of time and money.

Empirical Analysis

The first part analyses the manner in which economic aggregates are broken down into their sub-aggregates (defined by an administrative, geographical etc. nomenclature).

Tests on nine aggregates, including:

- Cameroun imports in 1957;
- Final consumption in ex-French West Africa in 1956;
- The budget for African wage-earners at Abidjan (1956 survey).

These show that the logarithms of the sub-aggregates are noticeably distributed according to a standard law, whose typical variation rarely exceeds 0.15 to 1.20.

The methods used are:

- Comparison between corresponding classes, typical variations 0.5, of empirical and theoretical frequencies;
- diagrammatical representations (histograms and probability density curves);
- X^2 adequation test.

Other adjustments have been tried (2- and 3-term Gram-Charlier's law and Galton's or Gibrat's law). The gain in accuracy which they provide does not justify the complication entailed in the calculations. We have therefore adopted the log-normal adjustment.

Simplified Estimation Method

We then consider a perfectly log-normal theoretical distribution of N values Z_p (p=1, 2...N) whose sum is T.

(1) First of all we show that the recapitulation S of the values above the semi-average $\frac{T}{2N}$ (of the values of such items) covers a fraction $K = \frac{S}{T}$ of the total aggregate which does not depend on the typical variation σ of the distribution of the logarithms Xp of the Zp's.

(2) We then find that this function K (σ) lies within 88% and 94% when σ varies from 0.25 to 1.10.

Consequently in the case of the habitual aggregates ($0.25 < \sigma < 1.10$) we can state that

$$K = \frac{S}{T} = 91\% \text{ to the nearest } 3\%.$$

(3) We deduce from this the following method of estimating T. We calculate $S = \Sigma Zp > \frac{T}{2N}$, then $T = \frac{1}{0.91} S \# 1{,}1\ S$ which estimates T to the nearest 3%. In other words, we add together the sub-aggregates above the semi-average and add 10%.

This semi-average being unknown, we use a simple and rapidly converging iteration method (1). This method applied to our nine aggregates gives a maximum estimating error of 3.5%.

(4) The estimating method having been defined, we emphasise the conditions for its application (sufficiently large number of items; typical variation within the zone under review).

Its accuracy is limited (approx. 3%) but it seems sufficient in many cases.

It has decisive advantages: the saving in time is considerable, since all that is necessary is to recapitulate the larger items in a proportion which fluctuates around 50% but which can be much less.

This method is obviously not applicable to the calculation of global quantities, which are conventionally determined in detail (e.g. imports and exports), but in the case of final domestic consumption, and consequently gross domestic product, it enables chronological series to be obtained at low cost.

In conclusion, this empirical method does not claim to give the best estimation of the aggregate, on the basis of its curtailed distribution (knowledge of the larger items) but it is genuinely simple and quick.

We finally point out that it is certainly capable of improvement and that this study can serve as a basis for further work (2).

(1) We start from T_1 (given a priori, incorrect), calculate $Z_1 = \frac{T_1}{2N}$, then corresponding S_1 and $T_2 = 1{,}1S_1$, then Z_2 and so on, Z_3.....

(2) Especially the existence of many other types of log-normal distribution (e.g. number of kilometres of road per circle in Ivory coast).

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